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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT

1962

CITY OF NORTH BAY

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ANNUAL REPORT

1962

ON THE

CITY OF NORTH BAY

SEWAGE TREATMENT PLANT

OWRC PROJECT 58-S-10



NORTH BAY AREA WATER POLLUTION CONTROL PLANT

NORTH BAY SEWAGE TREATMENT PLANT

OPERATED FOR

THE CITY OF NORTH BAY

BY

THE ONTARIO WATER RESOURCES COMMISSION

Mr. A. M. Snider	-	Chairman
Dr. A. E. Berry	-	General Manager
Mr. D. S. Caverly	-	Assistant General Manager, And Director, Division of Plant Operations
Mr. B. C. Palmer	-	Assistant Director, Division of Plant Operations
Mr. P. J. Osmond	-	Project Engineer, Division of Plant Operations

Prepared by the
Division of Plant Operations

GENERAL

In 1956, the City of North Bay approached the Ontario Water Resources Commission to finance, construct and operate sewage treatment facilities in the municipality. After preliminary discussions were held, it was decided that a joint scheme including the Townships of West Ferris and Widdifield as well as the City of North Bay would most adequately serve the needs of the area. Accordingly, the consulting engineering firm of Graham Reid and Associates Limited was engaged and plans and specifications were prepared.

At a public hearing of the OMB held Friday, September 26, 1958, approval was given to the integrated sewage works by the OMB.

It was agreed that the division of capital costs would be based on equalized assessment in the areas served. The equalized assessment will be recalculated at three year intervals. Operating costs are to be divided on the basis of actual usage of the system.

The project consisting of trunk sewers, manholes, appurtenances and an activated sludge sewage treatment plant was divided into four different contracts to facilitate construction. Tenders were called and contracts let to the following firms :

Stirling Construction was awarded Contract A which consisted of the construction of the sewage treatment plant, including a West Ferris wet well and outfall sewer.

Beaver Construction was awarded Contract B which included the construction of a trunk sewer and appurtenances from the sewage treatment plant to Timmins Street in North Bay

and Midwestern Construction was let Contract C and part of B including the construction of a sanitary trunk sewer on Queen Street from the sewage treatment plant to Judges Avenue and a sanitary sewer on Queen Street from the sewage treatment plant to Regina Street with manholes and appurtenances.

Midwestern Construction was also awarded Contract D which consisted of a trunk sewer and four lift stations in the municipality of West Ferris.

Construction was substantially completed in the fall of 1960 and the sewage treatment plant put into operation at that time.

PROJECT DESCRIPTION

1. Collection System

Sewage is collected in the laterals and services of the municipalities' sewerage systems. It flows from the municipalities' systems to the OWRC trunk sewers constructed under project number 58-S-10. In West Ferris four underground lift stations and 44,000 feet of asbestos cement sewer pipe transport the sewage to the West Ferris wet well located at the sewage treatment plant. Located near the Judges Avenue lift station is a metering pit consisting of a Parshall flume and stilling well. The flow of sewage is metered and the signal telemetered to the treatment plant where it is recorded.

The Widdifield and North Bay sewage is collected in trunk sanitary sewers and transported to the plant. The Widdifield sewage is metered at both Norwood

and O'Brien Avenues with signals telemetered to the plant.

The responsibility of the maintenance of the West Ferris pumping stations and the three metering pits has been left with the townships concerned.

The sewage from the West Ferris wet well is pumped into an influent manhole where it is combined with the flow from North Bay and Widdifield.

2. Influent Works

From the influent manhole the sewage flows into the influent works where the first degree of treatment is given. Grit is removed in two parallel chambers called detritors. In these two square chambers, the velocity of the sewage is reduced to a point whereby grit and sand will settle out but organics will not. The chambers are equipped with mechanical scrapers which gather the grit into the collector channels located beside the grit chambers. The collector channels are equipped with inclined rectangular dragout conveyors which discharge the grit into 45 gallon drums for removal. The channels are also equipped with organic return pumps for returning to the flow any organic material entering the channels. Prior to entering the main plant wet well the sewage passes through two griductors which screen and cut the organic solids. The griductors which are located in parallel are equipped with double-ended reversible cutter teeth. In the event that the griductors must

be taken out of service for repairs, the plant is equipped with a by-pass channel and coarse bar screen.

3. Primary Clarification

From the wet well the raw sewage is pumped into three primary clarifiers. The sewage is held in these rectangular tanks for a specified number of hours to effect the removal of organic suspended solids. The sludge is collected in the bottom of the tanks by means of a travelling scraper. The sludge collectors are mounted on carriages which travel back and forth on rails running the length of the tank. On the forward pass the sludge scraper collects sludge to one end of the tank and, on the return pass, grease is skimmed from the surface.

On the bottom and at one end of each tank are located two sludge hoppers into which the travelling scrapers deposit the settled solids. Each hopper has one draw-off line equipped with a motorized valve.

Sludge is drawn off at regular intervals. The scum skimmers remove the surface scum from the tanks and deposit it into the scum aprons from which it is pumped to the digester.

The settled sewage flows over the effluent weirs to the aeration section.

4. Raw Sludge Thickening Pit

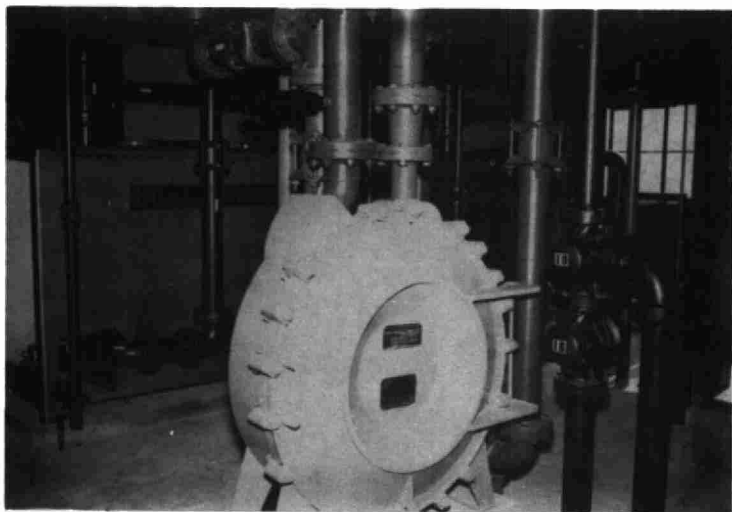
The sludge from the primary clarifiers can be pumped to a thickening pit where excess water is removed



GRIT REMOVAL EQUIPMENT



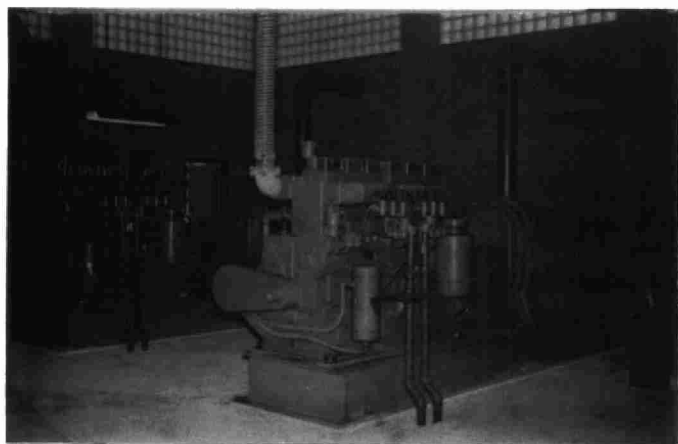
COMMINUTING EQUIPMENT



HEAT EXCHANGER



RAW SLUDGE PUMPS



AIR COMPRESSORS

before pumping it to the digester. Some pumping modifications have been effected to make better use of this tank.

5. Aeration and Final Clarification

Settled sewage from the primary clarifiers enters the aeration section of the plant where it is mixed with activated sludge from the final settling tank. The resultant mixed liquor is carefully controlled in order that the proper environment required for the growth of biological communities or "sludge flocs" is maintained. Air is interjected into the tank through spargers. Two blowers powered by gas engines which utilize digester gas provide the air required in the aeration section. Air can be provided at the rate of 1.35 cubic feet per gallon.

The floc, so produced in the aeration section, is actually a food centre. The bacteria require both food and oxygen to exist. The food is provided by the sewage entering from the primary clarifier and the air is the oxygen source. A balance must be maintained between the actual number of bacterial communities and the amount of incoming food. Should this go out of balance two results are possible.

Firstly, if there is more sewage than can possibly be absorbed by the activated sludge communities a septic condition will develop. On the other hand, if the incoming sewage is weak, the bacteria communities become starved and commence devouring one another. This results in a condition usually

referred to as nitrification. Normally there is quite a high reduction in BOD but the final effluent contains a tiny pin point floc. To counteract both of these extreme conditions continual control is maintained on the aeration section by means of a routine sampling procedure. From the test results, the variables are adjusted to establish optimum conditions in this section.

From the aeration section the mixed liquor flows to the final settling tanks where the settleable solids are removed.

Two circular tanks provide final clarification. The settled solids are collected on the bottom of the tank by means of submerged rotary sludge collectors. The sludge is returned to the aeration section where it is instrumental in the activated sludge process. The clear sparkling effluent after flowing over the weirs is collected in the launders and directed to the chlorine contact chamber.

6. Chlorine Contact Chamber

The final effluent prior to leaving the plant is chlorinated during the summer months as required by the Sanitary Engineering Division of the OWRC. The chlorine contact chamber is a circular tank which provides a retention period of 25 minutes for disinfection purposes. The chlorinated final effluent leaves the plant and flows out the outfall sewer to be discharged to Lake Nipissing, 1000 feet from shore.

7. Digestion

The raw sludge is pumped from the primary settling tank to the sludge thickening pit (when in service) and then to the primary digester. The sludge digestion in this plant is of the anaerobic alkaline process. Of the two digesters, the primary digester receives the raw sludge. The heat in this unit is maintained at around 90 degrees Fahrenheit. The digester is continually mixed. It is in the primary digester that the greatest proportion of sludge stabilization is achieved. The sludge passes through the acid stage to the methane gas producing stage. During this process vast amounts of combustible methane gas are produced. This gas is used to heat the digesters and also as fuel for the gas engines which drive the blowers.

Sludge is transferred from the primary digester to the secondary digester where concentration of the solids is effected. The solids are pumped from the bottom of the secondary digester to a waiting tank truck for disposal. Supernatant is returned from the secondary digester to the primary settling tank.

DESIGN CRITERIA

1. General

- (a) Type of plant - activated sludge process
- (b) Design population - 50,000 persons
- (c) Design plant flow - 4.0 MGD

1. General (cont'd)

- (d) Per capita flow - 80 Imp. gallons/capita/day
- (e) 5 day BOD of raw sewage - 150 ppm
- (f) Removal - 85%

2. Primary Treatment

(a) Grit removal

2 parallel units

11.5' x 11.5' x 2.0' liquid depth

volume - 3300 gallons

retention at design flow - 1.2 minutes

Velocity - .163 fps

type of unit - Walker type CRG grit collector
with dragout and organic return
pump.

(b) Screening

2 griductor comminutors (size 24, type C)
to screen and cut normal sewage solids to
pass through 3/8" slots at a maximum flow
rate of 4.05 MGD with a head loss of
approximately 7".

Bar screen on by-pass channel.

(c) Sewage Lift Pumps

Raw sewage pump well - 37' x 15' x 12'
liquid depth.

Pumps :- 2 - 4 MGD gas powered units

1 - 4 MGD electric powered unit

(d) Primary Clarifiers

3 rectangular units

size 90' x 30' x 10'

(d) Primary Clarifiers Cont'd

Volume - 505,000 gallons (total)

Retention at design flow - 3.0 hours

Surface settling rate - 500 gallons/square
foot of tank/day

Weir overflow rate - 44,000 gallons/lineal
foot of weir/day

Sludge and grease collectors - Hardinge
Clarifier Mechanisms.

3. Secondary Treatment

(a) Aeration Section

Number of units - 4 single pass

Size - 185' x 20' x 12' liquid depth

Total volume - 1.1 MG

Aeration period - 5.31 hours @ 1.25
dry weather flow

Air supply - 1.35 cu.ft./gal.

Type of aeration - diffused air

5 day BOD load on aeration tanks - 4200 lbs./day

(b) Final Settling Tank

Number of units - 2

Size - 60' x 60' x 11' liquid depth

Volume - 500,000 gallons

Retention at design flow - 3 hours

Surface settling rate - 550 gallons/sq.ft.
of tank/day

Weir overflow rate - 8,000 gallons/lineal
foot of weir length/day

Sludge collectors - Walker type RSX circular collector

(c) Chlorine Contact Chamber

1 - circular unit

Size - 34' \emptyset x 12.5 depth

Volume - 71,000 gallons

Retention - 25 minutes

1 - 1000 feet 36" \emptyset outfall

Retention - 16 minutes

Total retention - 41 minutes

Chlorinator - 500 # scale BIF semi-automatic
machine

(d) Outfall Works

1000 feet of 36" \emptyset steel pipe

(e) Digestion System

Digesters - 2, one floating cover

Size - 65' \emptyset x 21.0 liquid depth

65' \emptyset x 22.3' liquid depth

Volume - first stage - 70,000 cu.ft.

second stage - 74,000 cu.ft.

Per capita loading - $\frac{144,000}{50,000} = 2.9$ cu.ft./capita

Mixing - 3 Dorr 5 HP draft tube mixers
with reverse mechanisms

PLANT OPERATIONS

The plant is staffed by a superintendent and six operators. Two of the operators are responsible for the electrical and mechanical maintenance with the remaining four operators being on shift. Until December 1, 1962 there were three shifts per day giving the plant 24 hour supervision daily. However, the increasing workload during the year necessitated either an addition to the staff or a decrease in the hours of supervision. A study of the problem indicated that the installation of an alarm system would allow a decrease in supervision from 24 to 16 hours. Trouble sensing devices were installed at all critical points and were connected to a central alarm located in the City Police Department. Upon activation of the alarm during the non-supervised period, midnight until 8:00 AM, the officer on duty will call a member of the plant staff who will be able to rectify the problem.

Operators are required to do all grounds and building maintenance as well as ensure a high quality of plant effluent.

Each operator has spent time in the plant's laboratory and, when operating on the day shift, is required to do the following tests.

1. Settleable solids - raw sewage
2. Dissolved oxygen - raw sewage
3. Settleable solids - primary effluent
4. Dissolved oxygen - aeration mixed liquor
5. Suspended solids (ppm) - aeration mixed liquor
6. Settleable solids (%) - aeration mixed liquor
7. Settleable solids - final clarifier

8. Sludge Index (Mohlmann)
9. Dissolved oxygen - final clarifier
10. Chlorine Residual - chlorinated final effluent

Weekly tests are done on the digester volatile acids, pH of supernatant, pH of digested and raw sludges.

All of these tests are of extreme help to the operator in running his plant; primarily the mixed liquor suspended solids, sludge volume index and aeration tank dissolved oxygen, which assist in maintaining the balance of food organisms and aerobic bacteria essential to the activated sludge process.

Weekly samples are sent to the OWRC laboratory in Toronto for analysis.

A summary of some of the more important test results is to be found in the section entitled "Operating Data".

At the close of 1962 the plant staff consisted of :-

1. S. Healey - Superintendent
2. A. Gauthier - Operator-Electrical Maintenance
3. W. Sutherland - Operator-Mechanical Maintenance
4. G. Gerbasi - Operator
5. R. LePage - Operator
6. G. Sevigney - Operator
7. G. Smith - Operator

The plant staff was supplemented by casual labour during part of the summer for grounds maintenance and other overload jobs.

The operation of the project is supervised by the Division of Plant Operations which makes periodic inspection visits. The Electronics and Maintenance Sections of the Division assist the plant staff in rectifying plant problems. The Maintenance Section made a complete mechanical and electrical inspection of the plant and pumping stations in July. Also in July a complete inventory was taken of all the plant's tools and equipment. In June the Electronics Section instructed the plant staff on the installation of a high level alarm from each pumping station to the Plant Control Centre.

In November, the Electronics Section assisted the plant staff in preparing an alarm system necessitated by the change from 24 to 16 hour supervision. All of these services, as well as other OWRC head office services, are at no charge to the municipality.

OPERATING PROBLEMS

During 1962 the North Bay Sewage Treatment Plant experienced very few unexpected operating problems. Many of the problems which occurred in the first year of operation were solved and the remaining ones are being investigated to find the most practical solution.

An adequate industrial water supply has been ensured by installing a bulkhead in the outfall manhole. In the past there had been difficulty in maintaining a supply during the winter months when the lake level was low.

A sludge loading pad was installed at the sludge draw-off line south of the digesters. This installation has made clean-up of the sludge loading area much easier thus eliminating a possible source of odour.

The plant staff fabricated and installed a basket-screen for the bypass channel. This eliminates the possibility of floating solids being discharged to Lake Nipissing at times when the incoming flow exceeds the capacity of the plant and must be bypassed. A grating was installed in the outlet from the final clarifiers as a safety device to protect personnel especially when cleaning the launders.

As recommended in last year's Annual Report, a sidewalk was installed between the main control building and the digesters, venetian blinds were purchased for the lunch room, entrance foyer and office, and a guard rail was installed between the driveway and the chlorine contact chamber. The change to ton chlorine cylinders also was effected as recommended.

The location of additional chlorine dosage points is being investigated as is the feasibility of scales to control the discharge of chlorine more carefully.

The build-up of snow and ice on the primary clarifier rails which causes the travelling scraper carriage to rack, hence damaging the rails is still a problem. The application of anti-freeze to the track directly in front of the drive-wheel did not work as well as expected. An attempt will be made to prevent the stalling by applying traction by means of a chain and gear to the idle wheels on one of the carriages. Meanwhile the units are being shut down when icing conditions threaten.

During the periods in the winter when the carriages are shut down the oil in the gear reducer mechanisms thickens to such a degree that it must be heated before start-up can be effected. A propane type heater has been ordered which will be used to make these units operational after periods of shut down.

The sludge thickening pit has been returned to service due to the replacement of the screwPELLOR pump by a Simplex Balto Piston Pump. The screwPELLOR pump will be used as a much needed standby unit for the Triplex Raw Sludge Pump. The thicker sludge being transferred will reduce the hydraulic load on the digesters and it is hoped will assist in keeping the digester temperature up, hence increasing winter gas production.

Bulking conditions occurred in the clarifiers during May but this was attributed to the acceptance of septic tank

sludge at the plant. This practice was discontinued and with it the bulking problems were largely eliminated.

Mechanical breakdowns have been largely eliminated by a preventative maintenance program carried out by the plant staff. Any breakdowns that do occur can usually be corrected by the plant staff however, help can be obtained when required, from OWRC head office technicians and equipment manufacturers.

OPERATING DATA

During 1962 the North Bay Treatment Plant gave complete treatment to approximately 1119 million gallons of sewage. The following tables are a summary of the plant's operations over 1962. Included are flow results, performance data, grit and sludge removal, gas records, and operating costs.

Flow Results

Table I summarizes the plant flow characteristics for the year. These figures are the results of the contributions made by all three municipalities. This table coupled with Graph I indicate the status of the hydraulic load to which the plant is subjected. The 1961 flow results caused concern that the plant was becoming hydraulically overloaded and may have required expansion in the near future. However, the average daily flow has decreased from 3.90 MGD in 1961 to 3.07 MGD in 1962 and Graph I shows that the plant was overloaded on a daily basis approximately 9% of the time. These figures indicate that the hydraulic overload is not nearly as serious as was expected.

Table II summarizes the flow characteristics of the two municipalities West Ferris and Widdifield. The Widdifield flows are expected to increase considerably in 1963 since additions have been made to the system.

Organic Loadings and Removals

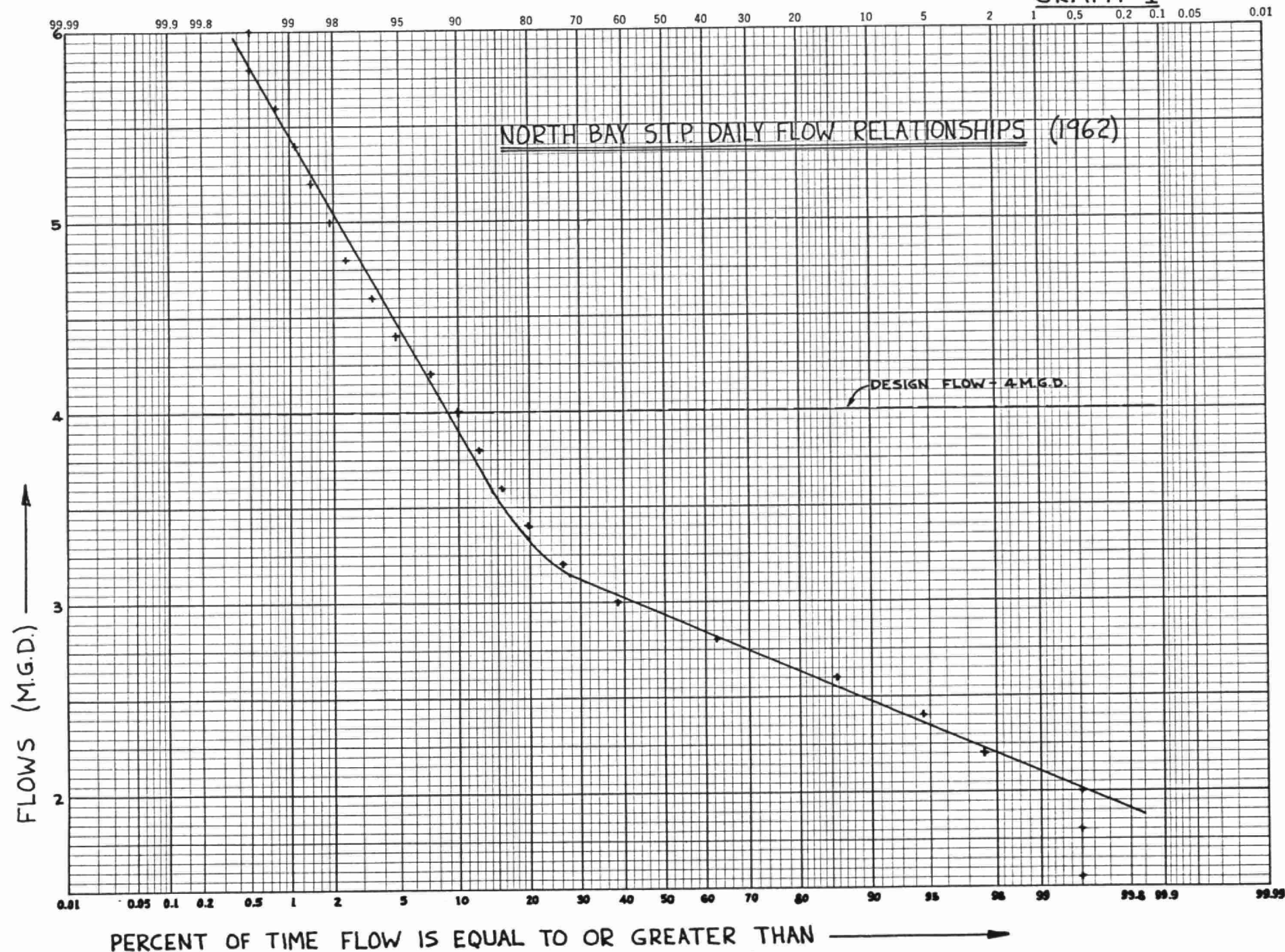
Table III is a summary of the analysis of the strengths of raw sewage and final effluent. BOD or biochemical oxygen demand is an indication of the oxygen required

TABLE I
NORTH BAY SEWAGE TREATMENT PLANT
FLOW RESULTS
1962

MONTH	TOTAL FLOW (MG)	AV.DAILY FLOW(MG)	MAX.DAILY FLOW(MG)	MIN.DAILY FLOW(MG)	MAX.INST. FLOW(MG)	MIN. INST. FLOW(MG)	AV.FLOW /CAPITA /Day (MG) *
Jan.	83.764	2.702	3.257	2.126	4.0	0.8	90.0
Feb.	71.482	2.553	3.232	1.429	4.7	0.4	85.0
Mar.	116.393	3.755	6.178	2.609	6.0	1.0	125.0
Apr.	124.658	4.155	5.234	3.454	7.0	1.5	138.5
May	109.744	3.540	5.784	2.109	7.5	1.0	118.0
June	94.250	3.140	3.710	2.671	7.5	0.8	104.5
July	87.564	2.825	3.283	2.212	4.2	0.9	94.5
Aug.	84.594	2.729	3.023	1.433	4.8	0.7	91.0
Sept.	85.788	2.893	4.343	2.514	4.4	0.5	96.5
Oct.	88.711	2.862	3.380	2.539	4.5	0.8	95.5
Nov.	84.607	2.820	3.183	2.321	3.8	0.8	94.0
Dec.	86.075	2.875	4.341	2.173	3.8	0.5	96.0
TOTAL:	1,118.630						
AVG:	93.219	3.071	4.079	2.299	5.2	0.8	102.4

* Based on a contributing population of 30,000 for the
three municipalities.

GRAPH I



WEST FERRIS AND WIDDIFIELD

FLOW RESULTS

1962

MONTH	WEST FERRIS				WIDDIFIELD			
	TOTAL FLOW (MG)	AV. DAILY FLOW (MG)	MAX. DAILY FLOW (MG)	MIN. DAILY FLOW (MG)	TOTAL FLOW (MG)	AV. DAILY FLOW (MG)	MAX. DAILY FLOW (MG)	MIN. DAILY FLOW (MG)
Jan.	11.539	0.372	0.392	0.352	4.976	0.161	0.228	0.102
Feb.	10.312	0.368	0.434	0.355	4.442	0.159	0.456	0.111
Mar.	15.192	0.489	0.794	0.322	6.214	0.200	0.543	0.133
Apr.	17.430	0.581	1.220	0.490	7.928	0.264	0.319	0.243
May	15.560	0.502	0.855	0.409	7.419	0.239	0.326	0.175
June	12.768	0.426	0.503	0.360	6.580	0.219	0.691	0.141
July	12.426	0.401	0.464	0.303	4.060	0.131	0.201	0.091
Aug.	11.715	0.378	0.404	0.361	3.251	0.105	0.144	0.045
Sept.	12.460	0.415	0.840	0.353	9.283	0.309	0.736	0.119
Oct.	13.465	0.434	0.844	0.310	3.691	0.119	0.366	0.066
Nov.	13.656	0.455	0.517	0.426	3.117	0.104	0.118	0.083
Dec.	13.246	0.442	0.586	0.350	3.138	0.105	0.149	0.075
TOTAL	159.769				64.099			
AVG:	13.314	0.439	0.654	0.366	5.342	0.176	0.356	0.115

to stabilize the organic matter in the sewage. SS refers to suspended solids in the sewage. This table coupled with Graphs II, III and IV indicates the status of the organic loading on the plant.

The organic loading on the plant has also decreased considerably from the 1961 loadings. This is partially due to the decrease in flow but also the concentrations of organic matter measured by the BOD and SS tests in parts per million (ppm) has decreased. The average BOD loading this year was 122 ppm as compared to 163 ppm in 1961 and the SS loading this year averages 200 ppm as compared to 240 in 1961.

Graph II indicates that the plant was over the BOD design loading of 150 ppm or 6000 lbs/day at design flow approximately 20% of the time. Graph III shows that the plant exceeded an SS loading of 200 ppm or 8000 lbs/day at design flow approximately 22% of the time. Graph IV compares the concentrations of BOD and SS in the influent and effluent against the percentage of the time different concentrations occurred. It can be seen that the plant exceeds the OWRC recommended BOD and SS effluent concentration of 15 ppm for secondary treatment plant 55% and 60% of the time respectively.

Solids Removal

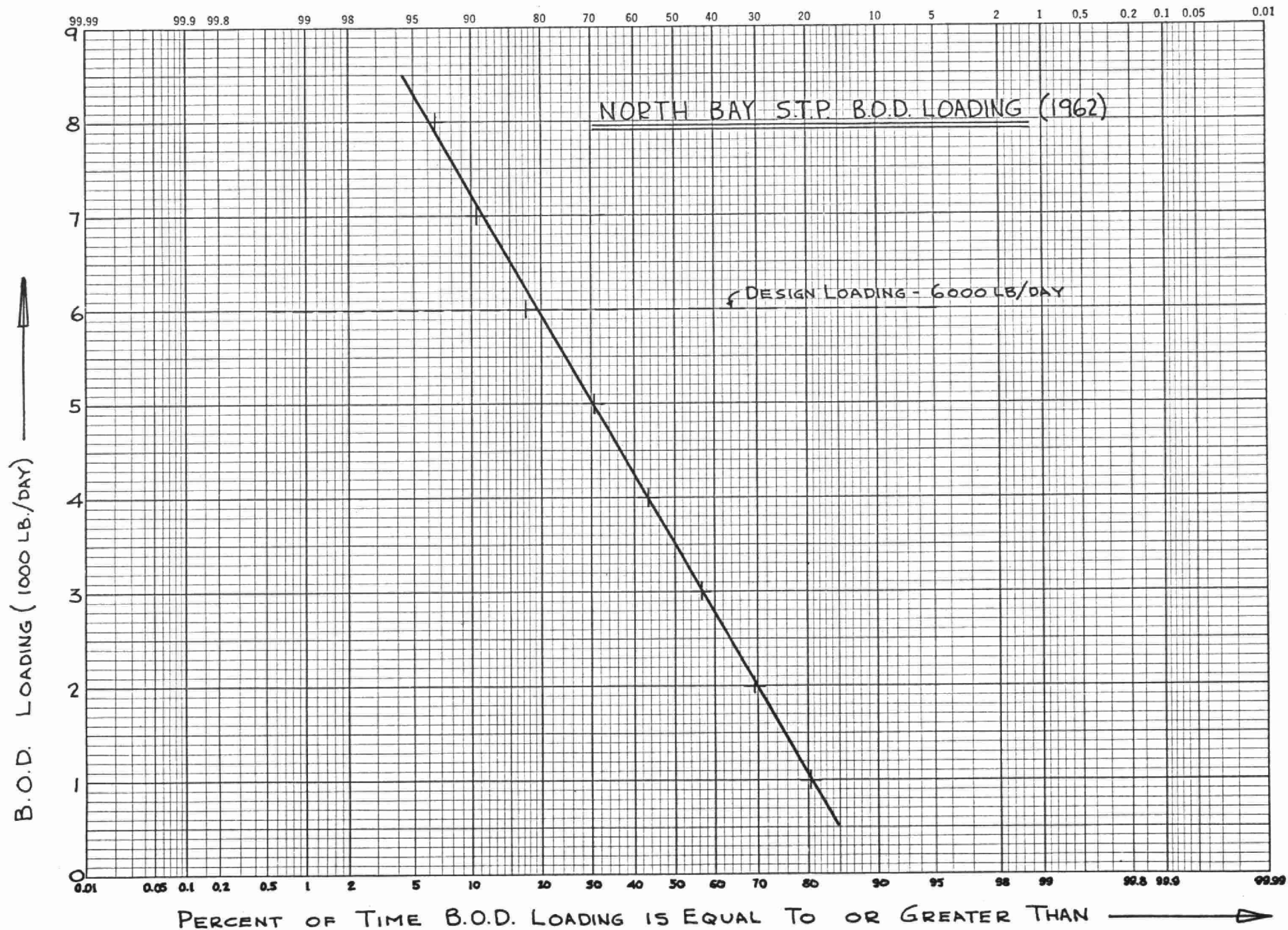
Table IV summarizes the solids removed by the plant both by the griductors and the digesters.

The grit removed in the plant is extremely high when compared with similar installations. This additional load on the plant can be attributed to several factors, with in-

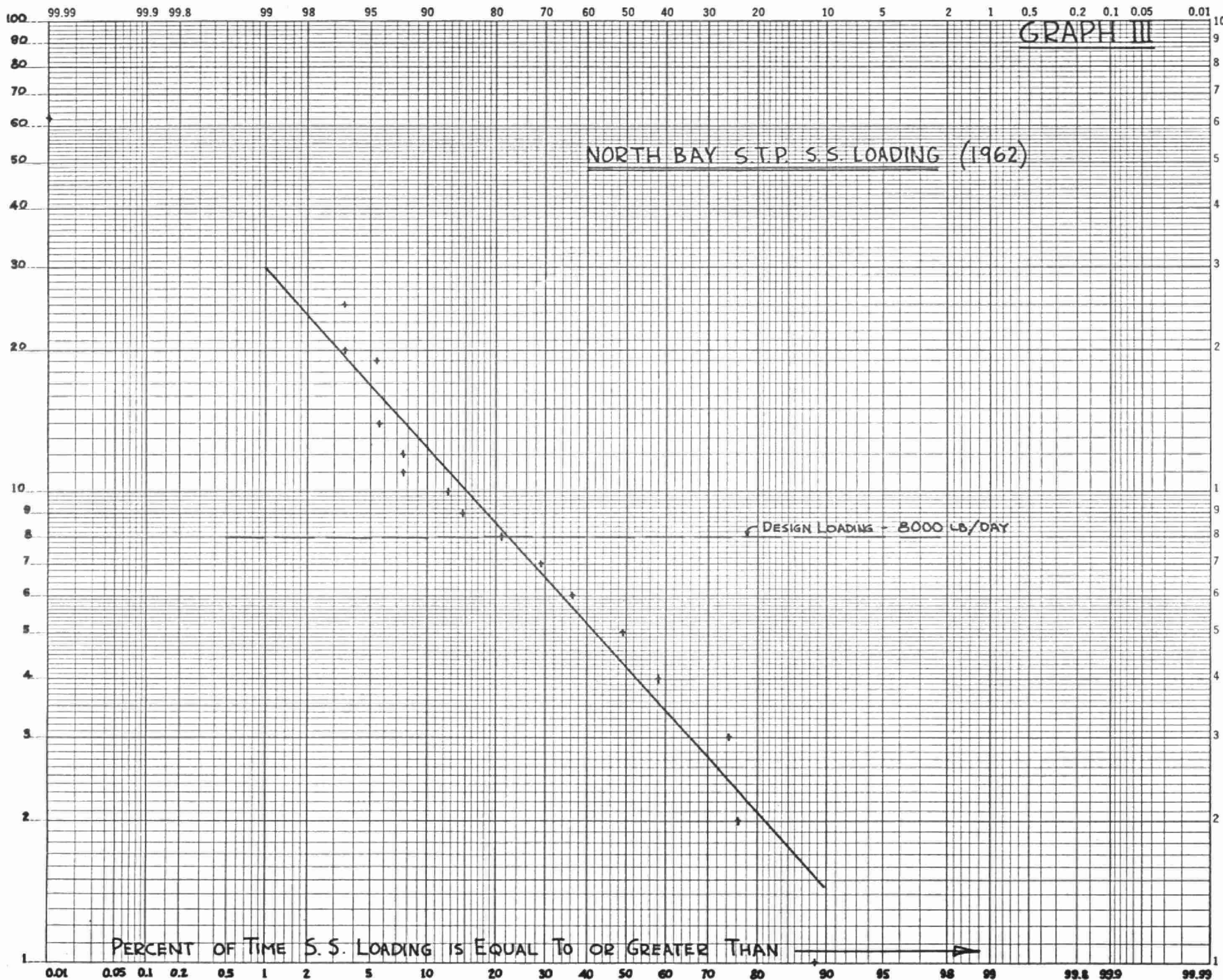
TABLE III
LOADINGS AND REMOVALS
1962

MONTH	TOTAL FLOW (MG)	INFLUENT		EFFLUENT		% REMOVAL	
		BOD (LBS)	S.S. (LBS)	BOD (LBS)	S.S. (LBS)	BOD	S.S.
Jan.	83.764	139,500	198,000	14,250	26,000	90%	87%
Feb.	71.482	101,500	169,800	11,400	22,200	89%	87%
Mar.	116.393	143,000	727,000	18,600	30,300	87%	96%
Apr.	124.658	89,600	202,000	13,700	33,600	85%	84%
May	109.744	67,000	53,800	9,200	22,000	86%	60%
June	94.250	82,000	52,900	17,900	15,100	78%	72%
July	87.564	38,500	211,000	10,500	8,750	77%	96%
Aug.	84.594	96,000	138,000	26,000	23,700	73%	83%
Sept.	86.788	92,000	202,000	19,900	14,750	79%	93%
Oct.	88.711	180,000	206,000	31,000	8,000	83%	96%
Nov.	84.607	190,800	184,500	35,500	14,400	82%	93%
Dec.	86.075	145,000	227,000	44,000	20,700	70%	91%
TOTAL:	1,118.630	1,364,900	2,572,000	251,950	239,500		
AVG:	93.219	113,742	214,333	20,996	19,958	82%	86.5%

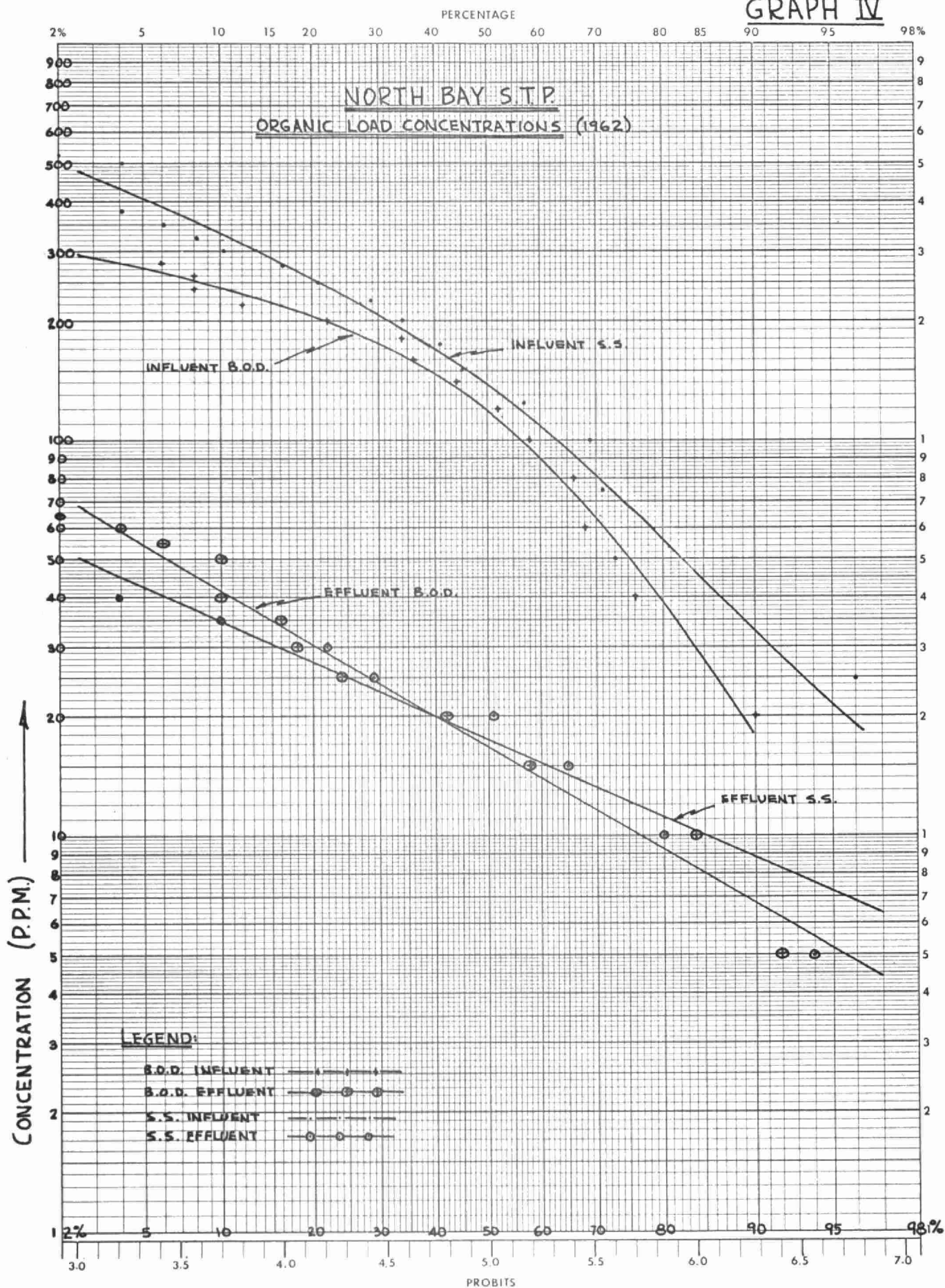
GRAPH II



S.S. LOADING (1000 LB./DAY)



GRAPH IV



SOLIDS REMOVAL

1962

MONTH	GRIT REMOVAL		DIGESTER REMOVAL		
	TOTAL (CU.FT.)	CU.FT./MG SEWAGE FLOW	GALLONS PUMPED TO DIGESTERS	GALLONS HAULED FROM DIGESTERS	GALLONS RE- MOVED/MG of RAW SEWAGE
Jan.	818	9.8	535,680	3,510	42
Feb.	540	7.6	483,840	98,000	1370
Mar.	701	6.0	535,680	178,500	1785
Apr.	737	5.9	518,400	157,500	1345
May	671	6.1	449,280	144,351	1320
June	793	8.4	518,400	361,464	3840
July	971	11.1	535,680	173,468	1980
Aug.	723	8.6	535,680	133,218	1575
Sept.	872	10.2	518,400	183,888	2140
Oct.	904	10.2	535,680	85,857	965
Nov.	1054	12.5	518,400	263,066	3120
Dec.	1073	12.4	622,080	-----	----
TOTAL:	9857		6,307,200	1,782,822	
Aug:	821	9.1	525,600	148,569	1624

filtration probably being the major cause. Other factors include the high percentage of organics in the grit and the practice of the Works Department in decanting its manhole cleanings into a manhole immediately upstream of the plant. A normal grit loading is in the range of 2 to 3 cu.ft. per MG of sewage, as compared to 9.1 for this plant.

The data on the sludge to and from the digester does not consider the return of supernatant to the sewage flow.

Gas Records

Table V is a summary of the natural gas consumption and sewage gas production. All sewage gas produced in the digester process is utilized either for digester heating or as fuel for the gas engines which drive the blowers. An increase in sewage gas production results in a decrease in natural gas consumption. During 1962 more sewage gas was produced and less natural gas was consumed than in past years. A preliminary investigation indicated that approximately 21 cu.ft. of sewage gas was produced per pound of volatile matter reduced. This is approximately 33% greater than the normal yield from most other plants, of 15 cu.ft. per pound of volatile matter reduced.

Proposed modifications to the water circulation system are expected to give even better gas production.

Chlorine Consumption

Chlorination of the plant effluent was carried out from May 6 until September 16. The average dosage rate of 6.4 ppm required 25,635 pounds of chlorine.

TABLE V
GAS RECORDS
1962

MONTH	PRIMARY DIGESTER TEMP OF.	SEWAGE GAS PRODUCED CU.FT.	NATURAL GAS CONSUMED CU.FT.	COST OF NATURAL GAS	COST PER M.G. OF RAW SEWAGE
Jan.	79°	1,130,230	66,400	\$ 428.60	\$ 5.12
Feb.	80°	1,020,310	53,640	403.85	5.64
Mar.	76°	1,029,070	64,680	415.95	3.57
Apr.	76°	860,090	62,510	381.85	3.06
May	77°	612,140	51,090	359.85	3.28
June	76°	855,330	35,840	272.40	3.89
July	91°	1,122,168	51,830	388.45	4.43
Aug.	93°	957,330	75,970	527.90	6.24
Sept.	93°	1,009,559	77,610	439.60	5.11
Oct.	90°	935,153	87,590	506.52	5.71
Nov.	85°	1,056,980	54,180	467.78	5.52
Dec.	84°	955,250	72,910	423.32	4.91
TOTAL:		11,543,610	754,250	5,016.07	
AVG:	83°	961,134	62,854	\$ 418.00	\$ 4.70

TABLE VI
AERATION TANK PERFORMANCE
1962

MONTH	MIXED LIQUOR S.S. (PPM)	LBS.BOD/100 LBS OF MIXED LIQUOR S.S. PER DAY	CU.FT. AIR/LB BOD SUPPLIED/REMOVED	SLUDGE VOLUME INDEX
Jan.	2064	11.5	1510	138
Feb.	2106	11	1600	133
Mar.	1738	18	1430	128
Apr.	1340	15	2539	136
May	1583	10.5	3560	131
June	1793	12	3209	135
July	1662	9	3554	145
Aug.	1871	8	3376	109
Sept.	1842	6.5	5519	117
Oct.	1596	22	1789	125
Nov.	1537	32	1244	120
Dec.	1769	16	2317	123
AVG:	1742	19.3	2637	128

Power Requirements

The power consumption at the plant during 1962 was 366,600 kilowatt hours or 309 KWH/MG of sewage treated. This consumption is considerably lower than other plants due to the use of sewage gas as fuel for driving some of the plant equipment.

Aeration Tank Performance

Table VI summarizes some of the factors which are used to control and determine aeration tank performance.

Operating Costs

The North Bay Treatment Plant was operated at a cost slightly below the 1962 forecast. Following is a comparison between the 1962 forecast and the actual expenses.

<u>ITEM</u>	<u>FORECAST 1962</u>	<u>EXPENSES 1962</u>
Payroll	\$ 31,500.00	\$ 32,267.50
Fuel	6,000.00	1,026.82
Power	6,000.00	9,689.46
Chemical	4,050.00	3,551.07
General Supplies	800.00	3,209.65
Equipment	600.00	1,473.83
Repairs and Maintenance	1,600.00	761.68
Sundry	16,100.00	16,352.13
	<hr/>	<hr/>
Contingency :	6,350.00	\$ 68,332.13
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	\$ 73,000.00	
Sundry includes :-	Grit and Sludge Hauling	\$ 7,675.03
	Taxes	2,024.76
	Water	5,007.80
	Telephone	429.24
	Workmans Compensation	243.00

Table VII is a summary of the actual monthly operating expenses for 1962.

DIVISION OF PLANT OPERATIONS

SUMMARY OF

PROJECT OPERATION STATEMENTS

BUDGET \$ 73,000.00

ACTUAL \$ 68,332.13

PROJECT NORTH BAY 58-S-10

OPERATING \$ _____ %

BUDGET \$ 73,000.00 100 %

ACTUAL \$ 68,332.13 93.5 %

UNDER \$ 4,667.87 6.5 %

MONTH	EXPENDITURE		PAYROLL		CASUAL PAYROLL		FUEL		POWER		CHEMICAL		GENERAL SUPPLIES		EQUIPMENT		REPAIRS & MAINTENANCE		WATER		SUNDRY	
JAN.	4356	57	2264	28	159	86			587	79			158	58	868	21	16	07	224	46	77	32
FEB.	4069	27	2274	58			134	70	874	29			76	81			45	18	200	90	462	31
MAR.	4329	43	2285	52			88	65	832	53	3	88	325	96			76	92	283	84	432	12
APR.	4190	41	2285	52			96	54	436	78	70	31							475	07	826	19
MAY	11068	14	2377	68	537	60	9	47	859	21	4159	40	323	70	288	40	88	51			2424	17
JUNE	6959	15	2285	52	188	67	140	43	1181	72			322	20	6	60	5	50	930	87	1897	64
JULY	5683	54	2387	73	235	30	9	64	440	02	(232	60)	300	14	64	38			576	04	1902	89
AUG.	8498	81	3445	59	344	52	5	19	686	16	2809	40	385	17	179	50	390	00			253	28
SEPT.	5448	71	2297	06	207	54	545	12	803	83	(900	00)	241	84			5	08	1180	87	1067	37
OCT.	2114	75	2297	06	202	64	18	08	400	80	(2250	00)	338	27					460	08	647	82
NOV.	3806	73	2297	06	42	85			824	20	(39	02)	39	81	66	74	12	50	432	85	129	74
DEC.	7806	62	+405 3445	33 59			(21	00)	+506 1255	52 61			626	86			121	92	242	82	1222	97
TOTAL:	68332	13	30348	52	1918	98	1026	82	9689	46	3551	07	3209	65	1473	83	761	68	5007	80	11344	32

SUMMARY OF COST DATA

The total construction cost for the entire project (OWRC 58-S-10) was approximately \$ 2,372,975.00 which was divided as follows :-

Trunk sewers	\$ 767,337.00
Treatment Facilities	1,226,338.00
Property	137,310.00
Engineering	122,228.00
Miscellaneous	48,246.00
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	\$2,301,509.00
Less Winter Works Subsidy	7,847.00
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	\$2,293,662.00
Add Capitalized Interest	79,313.00
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TOTAL:--	\$2,372,975.00

1. Per Capita Costs - 30,000 persons

a) Capital Costs -	\$ 79.10
b) Annual Costs (1962)	
- Operating Costs	\$ 2.35
- Debt Retirement, Interest and Reserve	\$ 5.97
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	\$ 8.32

2. Treatment Costs

a)	Cost Per Million Gallon (including Debt Retirement, etc.)	\$222.50
	Cost Per Million Gallon (Operation Only)	\$ 61.00
b)	Cost Per Pounds of BOD Removed (Operation Only)	\$ 0.06
	Cost Per Pounds of SS Removed (Operation Only)	\$ 0.03

The above costs are not necessarily exact and are meant for general information only.

RECOMMENDATIONS

The following items are to be incorporated into the plant during 1963. Allowance has been made for their estimated costs in the operating budget.

1. Additional chlorine dosage points are required in order that the raw sewage and the return-activated sludge can be chlorinated.
2. Materials should be purchased for the installation of pipe handrails by the plant staff around the griductors, bar screens, aeration tanks, etc.
3. The water circulation system is to be modified to provide more efficient operation. The digester heating arrangement should be made entirely separate from the engine cooling system. This modification should decrease the natural gas consumption by maintaining higher digester temperatures and decrease water consumption by recirculating cooling water.
4. The rails on the primary clarifiers must be straightened or replaced, whichever is most economical.
5. Painting of building flashings, exposed mechanical equipment, railings and walkways must be done in 1963.

Attempts will be made to make more use of the industrial water supply now that an adequate supply has been ensured.

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